UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF CHEMICAL SAFETY
AND POLLUTION PREVENTION

MEMORANDUM

SUBJECT: BEAD Chemical Profile for Registration Review: Etoxazole, 107091

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Product Review Panel date: April 16, 2014

INTRODUCTION

The purpose of this document is to convey usage information and a broad overview of the pest management roles of pesticides that are beginning to undergo registration review. The anticipated audience consists of the team of EPA staff currently evaluating the registration status of etoxazole, and eventually the general public. This document builds upon the data BEAD provides in the Label Use Information System (LUIS) reports and the Screening Level Usage Analysis (SLUA) to Registration Review teams. The document is based on information and data available to BEAD as of January 2014.

Etoxazole was conditionally registered in August 2002 as a miticide/ovicide. The Insecticide Resistance Action Committee (IRAC), a group of industry technical experts, classifies etoxazole in Group 10B, with a mode of action that is described as "mite growth inhibition". Hollingworth and Treacy (2006) describe etoxazole's activity on mites as follows: "… primarily active against tetranychid mites in the egg and larval stages, but it has no effect on adults and is rather slow acting. It has translaminar but no systemic activity. The half-life for dissipation in the field is a few days to a few weeks".

HISTORY OF BEAD ASSESSMENTS FOR ETOXAZOLE

In 2011, BEAD conducted a review of the registrant's request to extend exclusive use of registration data. In that assessment, BEAD concluded that etoxazole met benefits-related criterion IV for a three year extension of exclusive use of data by the registrant, in that it played a useful role in managing mites as part of an integrated pest management (IPM) program for nine minor crops included in the registrant's exclusive use request (pear, cherries, plums, peaches, strawberry, hops, walnuts, mint, and muskmelons). In addition, BEAD concluded that etoxazole met the requirement for Criterion III (compelling evidence that etoxazole can be used to manage resistance to acaricides with different Modes of Action) for muskmelon, because this crop did not have the very similar acaricides clofentezine and hexythiazox registered (Mallampalli, 2011).

COMMON FORMULATIONS AND APPLICATION METHODS

Etoxazole is commonly formulated as water dispersible granules, emulsifiable concentrates, and wettable powders. It is applied aerially or by ground applications using compressed air sprays, hydraulic sprayers, or ground boom sprayers.

USE SITES

Agricultural Use Sites:

Etoxazole is registered for use on the 8-10B Pepper/Eggplant subgroup, Cucurbit Crop Group 9, Pome Fruit Group 11, 13-07A Caneberry subgroup, 13-07F Small fruit vine climbing subgroup, except fuzzy kiwifruit, and 13-07G Low growing berry subgroup. Etoxazole is also used on alfalfa, carrots, corn, cotton, non-bearing fruit trees, hops, mint, stone fruits, subtropical/tropical fruit, tomato, tree nuts and Christmas tree plantings.

Non-Agricultural Use Sites:

Etoxazole is registered for use on ornamentals and in greenhouses.

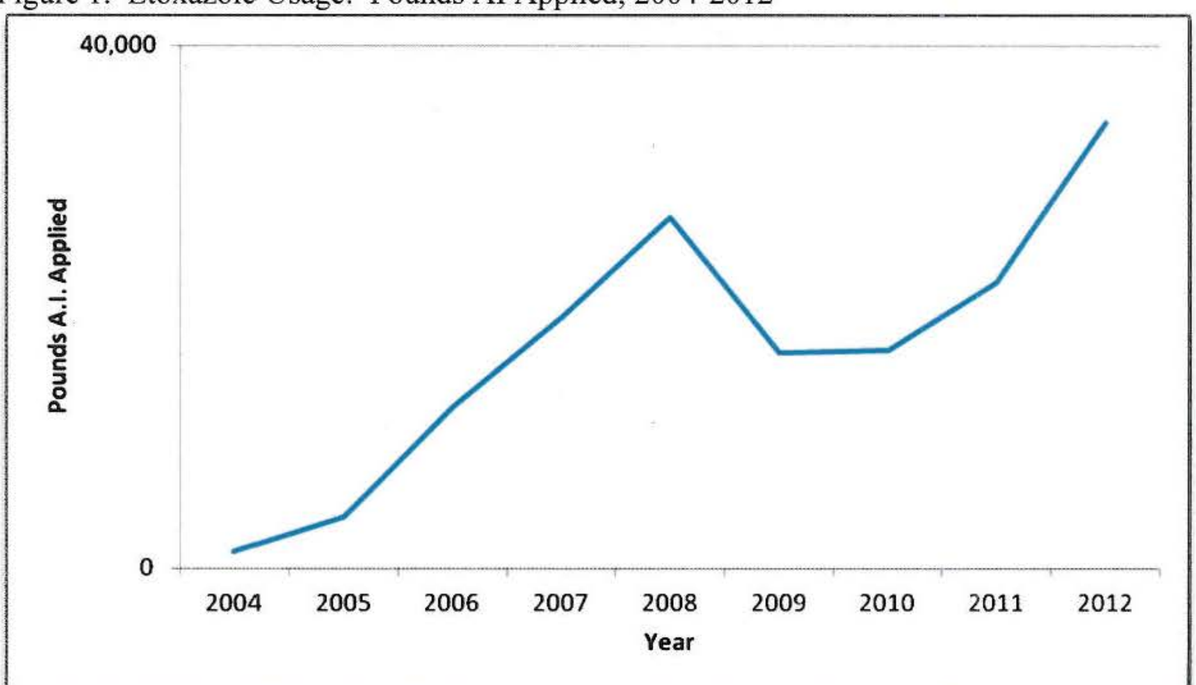
ETOXAZOLE USAGE

BEAD prepared a Screening Level Usage Analysis (SLUA) in May 2013 that provided data on use of etoxazole on nuts (almond and walnuts), pome fruit, stone fruit, grapes, melons, strawberries, and cotton in the U.S. during the 2004-2011 timeframe. The crops with the highest average percent crop treated include strawberries (15%) and pears (10%). The crops with the highest average pounds a.i. applied include almonds (6,000 lbs a.i.), grapes (5,000 lbs a.i.), and cotton (2,000 lbs a.i.).

Agricultural Usage Trend

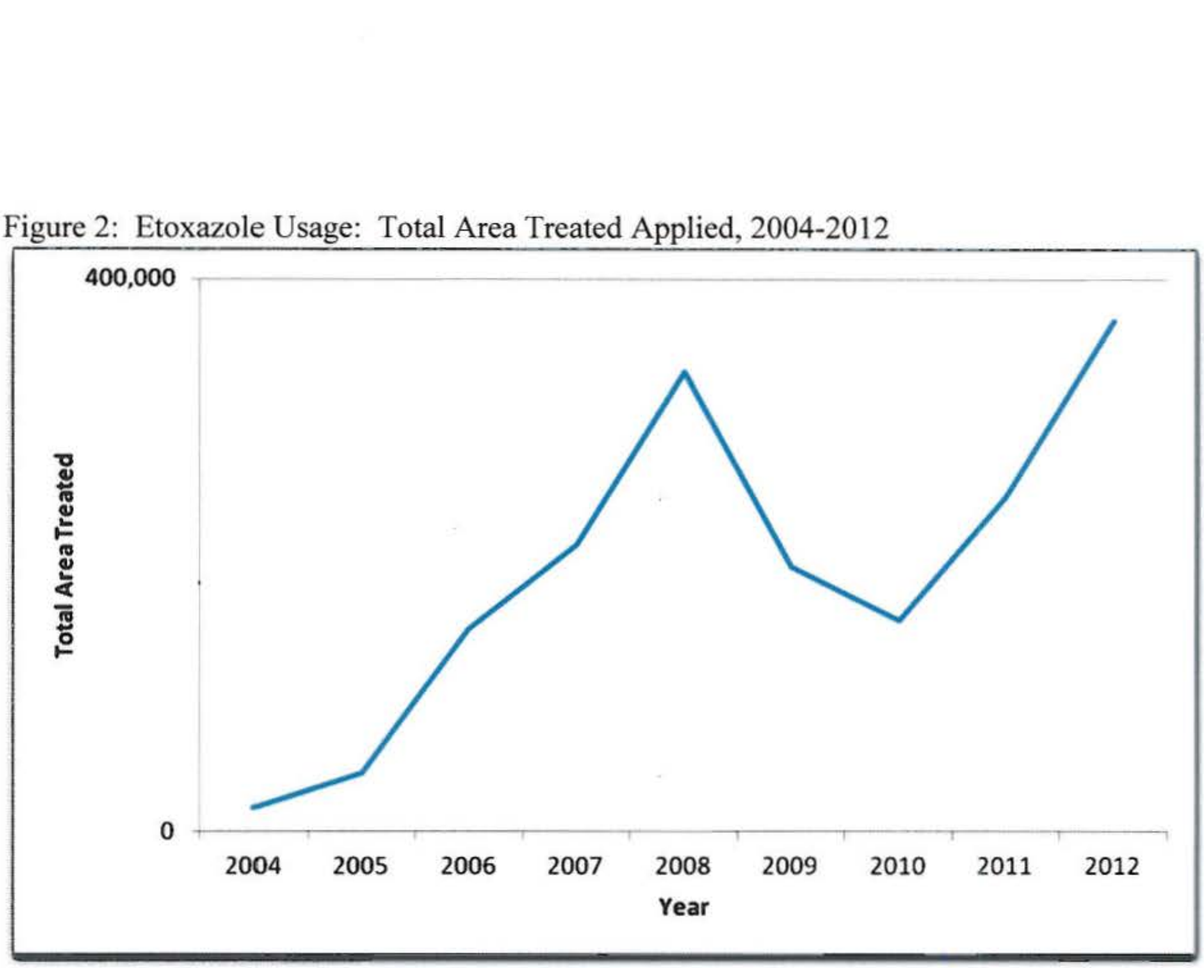
According to proprietary market research surveys, reported use of etoxazole in the U.S., in terms of pounds a.i. applied and total area treated, has continued to increase following a sharp decrease in use in the middle of the period shown in Figures 1 and 2. The overall average a.i. rate of application during this period was 0.09 lbs a.i. per acre.

Figure 1. Etoxazole Usage: Pounds AI Applied, 2004-2012



Source: EPA Proprietary Data, 2004-2012

Figure 2: Etoxazole Usage: Total Area Treated Applied, 2004-2012



Source: EPA Proprietary Data, 2004-2012

Agricultural Usage Trend: Top Crops, 2008-2012

Following a sharp decline in at the beginning of the period, reported use of etoxazole increased steadily during the remainder of the 2008-2012 time frame. The crops with the highest proportion of total pounds a.i. applied were almonds (37%), wine grapes (19%) and cotton (13%), followed by table grapes (8%), strawberries (7%), and pears (6%), as shown in Table 1. The average annual pounds a.i. applied during this period was 23,000 and the overall average a.i. application rate was 0.09 lbs a.i. per acre. Etoxazole was applied at higher than overall average application rates on all crops except cotton and table grapes.

Table 1. Etoxazole Use on Top Crops, 2008-2012

2008-2012 Average = 23,128 lbs/yr			
Crop	**% of Total Lbs A.I. Applied**	**% of Total Area Treated**	**Avg. A.I. Rate of Application (lb a.i. /acre)**
Almonds	37	31	0.11
Wine Grapes	19	14	0.13
Cotton	13	29	0.04
Table Grapes	8	9	0.08
Strawberries	7	5	0.13
Pears	6	4	0.12
Other*	10	8	0.09-0.14
*Other crops include apples, apricots, cantaloupes, cherries, corn, raisin grapes, peaches, walnuts, and watermelons.			

Source: Proprietary Data, 2008-2012

Agricultural Usage Trend: Top States, 2008-2012

The states with the highest proportion of pounds a.i. applied during the 2008-2012 timeframe were California (80%), Louisiana (5%) and Washington (5%). Etoxazole was applied at higher than overall average application rates in all states except Louisiana.

Table 2. Etoxazole Use in Top States, 2008-2012

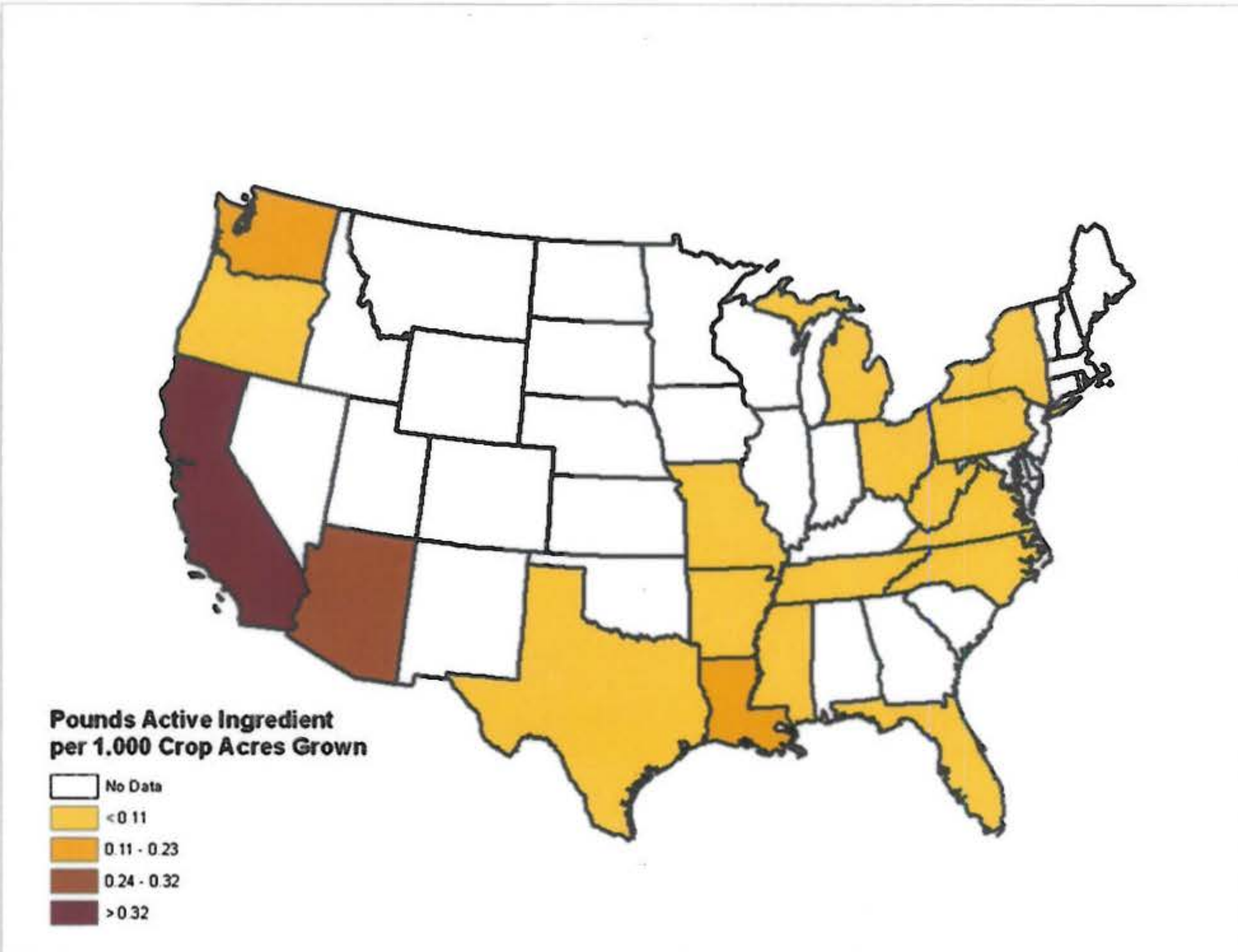
2008-2012 Average = 23,000 lbs/yr			
State	**% of Total Lbs A.I. Applied**	**% of Total Area Treated**	**Avg. A.I. Rate of Application (lb a.i./acre)**
California	80	69	0.10
Louisiana	5	10	0.04
Washington	5	4	0.12
Other*	10	17	0.03-0.14
*Other states include AZ, AR, FL, MI, MS, MO, NY, NC, OH, OR, PA, TN, TX, VA, and WV			

Source: Proprietary Data, 2008-2012

Agricultural Use Intensity of Etoxazole Use in the U.S.

Another measure of usage is the use intensity. In this analysis, the use intensity is expressed as the average annual amount (in pounds) of the active ingredient applied per 1,000 acres of crop acres grown. This differs from the application rate, which is expressed as the pounds a.i. applied per treated area. Figure 3 spatially represents etoxazole's use intensity in California on several crops including almonds and wine grapes. For more information about this map, see Appendix A.

Figure 3. Annual Average Agricultural Use Intensity of Etoxazole (2008-2012).



(Source: Proprietary Data, 2008-2012)

Non-Agricultural Usage

BEAD reviewed available data sources and found two years of reported use of etoxazole in nursery and floriculture as shown in Table 3 below. While national-level use in nursery and floriculture is relatively low (Table 3), use in California on ornamentals (in terms of area treated) appears quite high, based on CDPR data (Table 4).

Table 3. Etoxazole Use in Nursery & Floriculture

Year	Total Lbs A.I. Applied	Avg. A.I. Rate of Application (lb a.i./acre)
2006	800	0.06
2009	200	0.04

Source: USDA NASS Agricultural Chemical Usage Reports, 2006 and 2009

Table 4. Etoxazole Use in California on Ornamental Plants, 2010-2012

Commodity	2010		2011		2012	
	Lbs A.I. Applied	**Area Treated** (Acres)	**Lbs A.I. Applied**	**Area Treated** (Acres)	**Lbs A.I. Applied**	**Area Treated** (Acres)
Greenhouse Flowers & Plants in Containers	34	76	32	13	67	125
Outdoor Flowers & Plants in Containers	33	6	14	11	140	35
Total	67	82	46	139	207	160

Source: California DPR, Annual Statewide Pesticide Use Reports, 2010-2012

BIOLOGICAL ASPECTS RELEVANT TO ETOXAZOLE

The publicly accessible database of published scientific literature on arthropod resistance that is maintained by Michigan State University (available at http://www.pesticideresistance.com/index.php) lists only one publication documenting resistance to etoxazole. This item reports reduced susceptibility to etoxazole in two-spotted spider mites in Korea (KiSu et al. 2004). However, other studies have provided some evidence that resistance to clofentezine can lead to cross-resistance to etoxazole in European red mite (Pree et al. 2005), and that resistance to hexythiazox and etoxazole are genetically linked in spider mites (Asahara et al. 2008). Both clofentezine and hexythiazox are classified in the Mode of Action Group 10A, and are mite growth inhibitors similar to etoxazole. The extent of such cross-resistance in U.S. crops is not clear to BEAD. Pree et al. (2005) obtained their results using laboratory colonies established from mites collected in Canadian apples and peaches; Asahara et al. (2008) used spider mites collected in Japan.

As mentioned earlier in this document, for at least some minor crops etoxazole appears to be a useful component in IPM programs, largely because its efficacy appears to be very mite-specific, and thus has lower toxicity to some non-mite beneficial insects than alternatives such as some synthetic pyrethroids, propargite, dicofol, and pyridaben. For example, Ashley et al. (2006) found that etoxazole did not affect minute pirate bugs as much as either fenpropathrin or propargite. Pirate bugs are common predators of the eggs and larvae of many agricultural pests, including mites and aphids.

ROLE OF ETOXAZOLE IN PEST MANAGEMENT

Based on the available usage data, etoxazole appears to play an important role in the production of major crops in California, including strawberries, pears, almonds, and wine grapes. The available data also shows considerable use of etoxazole in California on greenhouse, containerized, and outdoor plants and flowers (Table 4). Etoxazole appears to be an effective mite growth inhibitor and has lower toxicity to some non-mite beneficial insects such as the pirate bugs, which are predators of agricultural pests. It is also a useful component in IPM programs.

BEAD is unsure why there is greater use of etoxazole in California ornamental production as compared to national-level data. Quinn et al. (2009) mention etoxazole and hexythiazox (a very similar insecticide) among several options useful in nursery and greenhouse IPM programs that target spider mites. However, hexythiazox is limited to one application in California production of these crops, while etoxazole can be applied up to two times per season. This may be a factor in its greater use. Other factors, such as lower product cost, product availability, or localized resistance, may be driving factors as well.

INFORMATION THAT MAY BE USEFUL FOR BEAD'S FUTURE WORK ON ETOXAZOLE

Obtaining the following usage information may improve future assessments conducted by the Agency related to the use and importance of etoxazole:

1) Typical application timing in each registered crop.
2) Details on the pest management importance of etoxazole in California ornamental production.
3) If more than one application is typically made, the typical re-application interval (per crop).
4) Recent resistance reports for etoxazole in populations of important target pests, in particular cases of cross-resistance to both hexythiazox, clofentezine, and etoxazole.

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APPENDIX A

The map included herein is primarily for the use of the risk assessors in the Environmental Fate and Effects Division. The map provides a very broad geographical view of the average annual amount (in pounds) of the active ingredient applied per 1,000 acres of crop acres grown. These data are included in the maps because risk assessors are interested in the amount of a pesticide used across agricultural land. The calculated values presented in the map are not equivalent to an application rate (lb a.i./A).

The data used to make these maps have several limitations. Any interpretation of the maps should consider the underlying data and the associated limitations carefully.

The numerator (annual average pounds applied) is based on private market surveys of pesticide use in agriculture averaged over the last five years (Proprietary Data, 2008-2012). These surveys cover about 60 crops and are targeted in states that produce the majority of the crop. Although the surveys capture most of the use of a particular active ingredient in agriculture, there are several limitations to these surveys.

- States with minor production of a surveyed crop are not sampled
- Not all types of pesticides are surveyed in every crop in every year
- Many specialty crops with very small acreages are not included in the survey

The result of these limitations is that states that show no usage may actually have a small amount of the active ingredient being used. In some cases the displayed use intensity may be distorted because the surveyed crops and the reported pesticide usage may not accurately represent the actual pesticide usage on the crops produced in the state.

The denominator (1,000 crop acres grown) was also obtained from the same private market survey database. The "Crop Acres Grown" variable represents the total acres grown in a given state of all of the surveyed crops. This value is independent of pesticide usage and pesticide registration. It is important to note that the surveyed crops (about 60) are sampled from states that are major producers of each crop. Therefore, there are cases where the actual crop acreage in a state is higher than that reported by crop acres grown in the survey because either that state and/or crop was not included in the survey.

The reader should pay particular attention to the figure legends and realize that a map prepared for a particular chemical is not directly comparable to a map prepared for a different chemical as the legend bins will likely be different.